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PLANETARY PHENOMENA FOR JULY AND AUGUST, 1916

BY MALCOLM MCNEILL.

PHASES OF THE MOON, PACIFIC TIME.

First Quarter.	July 8th, 3 ^h 55 ^m A.M.	First Quarter.	Aug. 6th, 1 ^h 6 ^m P.M.
Full Moon...	" 14th, 8 40 P.M.	Full Moon...	" 13th, 4 0 A.M.
Last Quarter..	" 21st, 3 33 P.M.	Last Quarter.	" 20th, 4 53 A.M.
New Moon...	" 29th, 6 15 P.M.	New Moon...	" 28th, 9 25 A.M.

The third eclipse of the year, a Partial Eclipse of the Moon, will occur on the evening of July 14th, and will be visible generally thruout the United States. The maximum obscuration of the Moon will be four-fifths of its diameter, so this eclipse will be much more notable than that which occurred in January. The circumstances of the eclipse are as follows:

Moon enters penumbra	July 14th, 6 ^h 18 ^m P. M.
Moon enters shadow	7 19 P. M.
Middle of eclipse	8 46 P. M.
Moon leaves shadow	10 12 P. M.
Moon leaves penumbra	11 14 P. M.

The fourth eclipse of the year is an *Annular Eclipse of the Sun*. It will not be visible even as a partial eclipse except in the regions of the Indian and South Pacific oceans. The line of central eclipse runs thru Australia and Tasmania.

On the night of July 23-24th the Moon will again pass over the *Pleiades* group and a number of the brighter stars will be occulted. As the Moon is in her last quarter the immersions will occur at the bright limb.

The Earth reaches its maximum distance from the Sun on the night of July 2nd.

Mercury is a morning star at the beginning of July, rising a little more than an hour before sunrise, having reached greatest west elongation at the end of June. By the middle of the month the interval is less than one hour and the planet

is too near the Sun for naked eye view. It passes superior conjunction and becomes an evening star on the morning of July 28th. By the end of August it will have nearly reached greatest east elongation. The elongation will be rather a large one, but the planet is so far south of the Sun, about 11° , that it remains above the horizon less than an hour after sunset, too near for a naked eye view. *Mercury* is in conjunction with *Venus* on July 13th and with *Saturn* on July 21st, but the planets are all too near the Sun for easy view.

Venus passes inferior conjunction with the Sun on July 3rd and becomes a morning star. Its great brightness will allow it to be seen a few days later in the early morning twilight. The two bodies separate quite rapidly and shortly after the middle of the month *Venus* will rise an hour before sunrise. It will then be an easy object. By the end of August it will rise more than three hours before sunrise. By the end of August the planet will have nearly reached greatest west elongation. Half way between conjunction and greatest elongation *Venus*, on August 9th, will again be at its greatest brilliancy, being visible to the naked eye for some weeks in full daylight. Its motion among the stars is about 10° westward up to July 25th. It then begins to move eastward along a line south of the line of its westward motion, and by the end of August will have moved 21° eastward to a point about 14° south of *Castor* and *Pollux*.

Mars is still in the evening sky, setting shortly before 11 P. M. on July 1st, about three and one-half hours after sunset. The Sun is slowly overtaking it in their common eastward motion among the stars, so that by the end of August it sets less than two hours after the sun, but it is still far enough away to be easily visible in the evening twilight. During the two-months' period it moves about 34° eastward and 15° southward from the eastern part of *Leo* to the corresponding part of *Virgo*. Toward the end of August it is near the first magnitude star *Spica*, α *Virginis*, passing about 2° north of the star on August 27th. Its actual distance from the Earth is continually increasing altho at a smaller rate, and there is consequently a diminution in brightness of about

one-third, but it still remains a little brighter than the pole star.

Jupiter rises shortly after midnight on July 1st and shortly before 9 P. M. at the end of August. It is in the western part of the constellation *Aries* and moves about 4° eastward and 1° northward up to August 25th, and then begins to move slowly westward. This retrograde motion will continue about four months, until near the end of December, and will amount in all to about 10° .

Saturn is an evening star on July 1st, but too close to the Sun for naked eye view. The Sun rapidly overtakes it in their common eastward motion, and conjunction is passed on July 12th. The two bodies separate rapidly and by the end of the month the planet rises an hour and twenty minutes before sunrise. For the last week of July it can be seen in the morning twilight if the weather conditions are good. The distance between Sun and planet continues to increase so that at the end of August the planet rises at about 2 A. M. It is in the constellation *Gemini* and moves about 8° eastward during the two months on a line about 10° south of *Castor* and *Pollux*. *Saturn* will be occulted by the Moon on the night of August 24-25th. The occultation will be visible in general thruout the United States at 3^h to 4^h A. M. in the eastern part of the country, and earlier by local time in the west.

Uranus will rise shortly before 10 P. M. on July 1st and long before sunset on August 31st; so it is getting into fair position for observation. It passes opposition on August 10th. It remains in the constellation *Capricorn* and moves about 2° westward during the month. No bright stars are very near, but at the end of August it is about 6° west of the third magnitude δ *Capricorni*, 4° west of the 4th magnitude γ *Capricorni*, and about 1° north of the small fourth magnitude ι *Capricorni*.

Neptune reaches conjunction with the Sun on July 25th, and thruout the two months is too near the Sun for observation even with a telescope.